

# PATENT SPECIFICATION

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## (54) IMPROVEMENTS IN ARTIFICIAL LIMBS

(71) We, J.E. HANGER & COMPANY LIMITED, a British Company at Queen Mary's Hospital Roehampton Lane, Roehampton, London SW15 5PL, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

10 This invention is concerned with artificial legs and more particularly to the shin and foot portion of such legs.

It is desirable for the foot of an artificial leg to be capable of some limited rotation about the axis of the shin so that the foot can be turned inwardly or outwardly in simulation of the natural movement of a human foot. An object of the present invention is to provide an artificial leg in which means for permitting such inversion and eversion are provided between the shin portion and the knee joint.

Such means are hereinafter referred to as a leg rotator.

25 The invention provides an artificial leg comprising a knee assembly, a shin portion rotatable about its longitudinal axis in relation to the knee assembly and carrying a foot portion, and a torsion member of elastomeric material secured respectively to said knee assembly and to said shin portion so that the foot portion may be inverted or everted by limited relative rotation between the knee and the shin against torsion in the torsion member.

A leg rotator for incorporation in an artificial leg between the shin and the knee assembly may comprise a spindle adapted for securing to a lower member of the knee assembly, a housing coaxial with the spindle adapted for securing in the upper end of a tubular shin portion and an elastomeric torsion bush secured to said spindle and to said shin portion.

40 The shin portion may be mounted on

bearings on a spindle adapted for securing to a lower member of a knee assembly and the torsion member may comprise an external sleeve secured at one end to this lower member and at its other end to the shin portion by Jubilee (RTM) clips or the like.

In another form, the torsion member may comprise a sleeve between the spindle and the inside of the shin portion and secured to both the spindle and the shin portion.

Other parts of the invention are embodied in the preferred forms which will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a cross-section of one form of leg rotator; and

Figure 2 is a cross-section of another form of leg rotator.

In the form shown in Figure 1, a spindle 2 is adapted at one end for securing to a knee joint. For example, the knee joint may have a lower plate from which depend brackets supporting a cross-member. The top end of the spindle 2 may then be received in a socket in this cross-member.

Mounted on the spindle 2 is a torsion bush 5 comprising an elastomeric bush 10 which surrounds the spindle 2 and is bonded thereto. A housing 11 surrounds and is bonded to the bush 10 and this housing is adapted to be secured in the top of the tubular shin member 12 of the artificial leg.

The shin member carrying a foot can thus be rotated about its vertical axis relative to the spindle 2 fixed to the knee assembly to an extent determined by the resultant torsion in the elastomeric bush. By this limited rotation, the foot can be inverted or everted in use.

A spherical bearing 4 is carried by the spindle 2 above the torsion bush 5 and this bearing is sealed by a felt washer 3. A spherical bearing 7 is carried by the spindle below the torsion bush 5 and the assembly of bearings 4, 7 and bush 5 is secured axially by a

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5 screw 9 threaded into the spindle 2. A laminated shin 8 is provided around this screw and can be adjusted by peeling to give a "no end play" condition with freedom of rotation.

10 The outer casings of the bearings 4 and 7 are of the same diameter as the outer casing of the torsion bush so that the whole assembly can fit snugly into the tubular shin member.

15 It will be noted that as the leg rotator fits within the tubular shin member, there is no difficulty in accommodating a bush of considerable length. This means that the length

20 of the bush member can be so chosen that the force required to invert or evert the foot is appropriate to the user of the leg.

25 In the form shown in Figure 2, the torsion member is arranged externally of the shin portion 12. A spindle 2 is secured at one end to a socket 13 forming part of a knee-joint, for example by expanding the recessed end 14 of the spindle 2 within the socket 13 by a tube expander 15.

30 The spindle 2 is formed with spaced bearing surfaces 16, 17 on which rotates a bearing housing 18 mounted in the end of the tubular shin portion 12. The bearing housing 18 is mounted between thrust bearings

35 19, 20 at top and bottom respectively, located by locating pins 21, 22 respectively. A thrust collar 23 located by a pin 24 is secured to the lower end of the spindle 2 by a screw

40 26 which retains the assembly on the spindle 2. An adjustable shim washer 27 is provided between the collar 23 and the end of the spindle 2. One end of a torsion member 28 comprising a tube of rubber or other elastomeric material is secured by a clip such as

45 a Jubilee (RTM) clip 29 around a cylindrical surface of the socket 13. The rubber tube extends downwardly around the end of the shin portion 12 and is secured thereto by a Jubilee (RTM) or other clip 30. The torsional

50 stiffness of the device depends on the spacing of the clips 29 and 30 and can be adjusted by adjusting this distance. The torsion member can extend over a considerable length of the shin portion so that its stiffness, and so the force required to invert or

evert the foot, can be chosen appropriate to the user of the leg.

55 It will be understood that spherical bearings, as in the form of Figure 1, can be used with the external torsion member of Figure 2 or the plain bearings of Figure 2 can be used with an internal torsion member as in Figure 1.

60 It will be understood that the invention is not restricted to the details of the preferred form described by way of example which can be modified without departure from the scope of the accompanying claims.

WHAT WE CLAIM IS:-

65 1. An artificial leg comprising a knee assembly, a shin portion rotatable about its longitudinal axis in relation to the knee assembly and carrying a foot portion, and a torsion member of elastomeric material secured respectively to said knee assembly and to said shin portion so that the foot portion may be inverted or everted by limited relative rotation between the knee and the shin against torsion in the torsion member.

70 2. An artificial leg according to claim 1 in which the torsion member is an elastomeric sleeve surrounding the shin portion on the outside thereof.

75 3. An artificial leg according to Claim 1 in which the torsion member comprises an elastomeric sleeve mounted within the shin portion.

80 4. An artificial leg according to Claim 3, incorporating a leg rotator between the shin and the knee assembly said leg rotation comprising a spindle adapted for securing to a lower member of the knee assembly, a housing coaxial with the spindle adapted for securing in the upper end of a tubular shin portion and an elastomeric sleeve secured to said spindle and to said shin portion.

85 5. An artificial leg substantially as described, with reference to the accompanying drawings.

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1550658 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

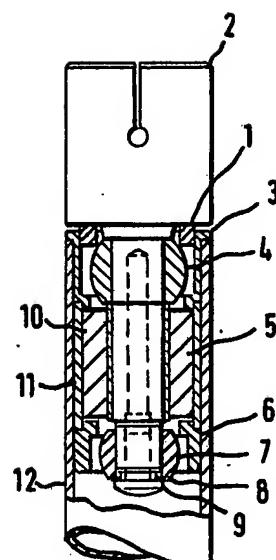


FIG.1

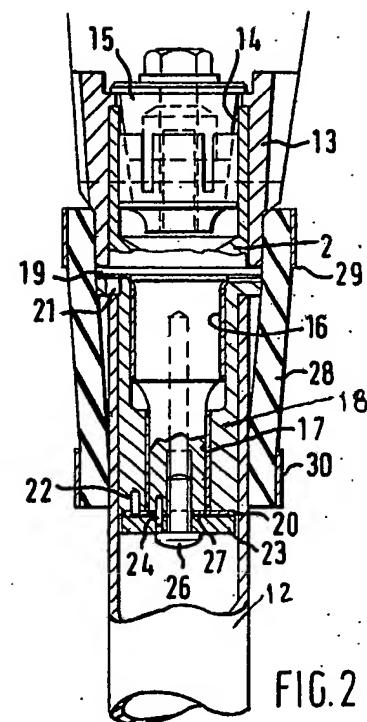


FIG.2

